

CLAIMS

What is claimed is:

1. A reaction apparatus, comprising:
a main body having
a reaction chamber with an upper opening thereof,
a lid hinge, and
a lid combined to the lid hinge, rotationally opening and closing the upper opening;
a lifting member having
a first end separated from a rotation axis of the lid, and rotatably combined with the lid, and
a second end rotatably combined to the main body, that moves in opening and closing directions; and
a driver activating the lifting member.
2. The reaction apparatus according to claim 1, wherein:
the reaction chamber creates a vacuum condition when the lid is closed.
3. The reaction apparatus according to claim 1, wherein the driver comprises:
a driving motor;
a location sensor limiting the movement of the lifting member; and
a controller controlling the driving motor with a signal transmitted from the location sensor.
4. The reaction apparatus according to claim 3, wherein:
the lifting member is provided in a pair at opposite sides of the main body.
5. The reaction apparatus according to claim 2, wherein the driver comprises:
a driving motor;
a location sensor limiting the movement of the lifting member; and
a controller controlling the driving motor with a signal transmitted from the location sensor.

6. The reaction apparatus according to claim 5, wherein:
the lifting member is provided in a pair at opposite sides of the main body.
7. The reaction apparatus according to claim 1, wherein the lid hinge comprises:
a hinge bracket combined to an end of the main body;
a main hinge rotatably combined to the hinge bracket;
a main hinge shaft rotatably combining the hinge bracket with the main hinge;
an auxiliary hinge rotatably combined to the main hinge at an end part of the lid,
rotatable through a predetermined range; and
an auxiliary hinge shaft rotatably combining the main hinge with the auxiliary hinge.
8. The reaction apparatus according to claim 7, wherein:
the main hinge is provided with a main hinge hole penetrated along a direction of a
center line on which the lid rotates, and a first auxiliary hinge hole penetrated to accommodate
the auxiliary hinge shaft, positioned approximately parallel to the main hinge hole.
9. The reaction apparatus according to claim 8, wherein:
the auxiliary hinge is provided with a second hinge hole along the first hinge hole, to
accommodate the auxiliary hinge shaft together with the main hinge.
10. The reaction apparatus according to claim 8, wherein:
the auxiliary hinge and the main hinge are engaged to each other with a predetermined
distance therebetween, the lid rotating within the predetermined range.
11. The reaction apparatus according to claim 9, wherein:
the auxiliary hinge and the main hinge are engaged to each other with a predetermined
distance therebetween, the lid rotating within the predetermined range.
12. The reaction apparatus according to claim 7, wherein:
the lid hinge is plurally provided, and respectively combined to opposite sides of the end
part of the main body.
13. The reaction apparatus according to claim 7, wherein:
the main hinge shaft and the hinge bracket are integrally formed.

14. The reaction apparatus according to claim 7, wherein:
the main hinge shaft and the main hinge are integrally formed; and
the main hinge is combined to the hinge bracket.

15. The reaction apparatus according to claim 7, wherein:
the auxiliary hinge shaft is integrally formed with one of the main hinge and the auxiliary hinge; and
the auxiliary hinge shaft is rotatably combined to the remaining one of the main hinge and the auxiliary hinge.

16. The reaction apparatus according to claim 3, further comprising:
a movable hinge rotatably combining the lifting member to the lid, the lifting member rotating relative to the lid.

17. The reaction apparatus according to claim 16, wherein the movable hinge comprises:
a movable hinge accommodating part combined to the lid, having a movable hinge hole, which is provided approximately parallel to the rotation axis of the lid; and
a movable hinge shaft accommodated in the movable hinge hole, rotatably combined with the first end of the lifting member.

18. The reaction apparatus according to claim 17, wherein:
the movable hinge hole is elongated to allow the movable hinge shaft to move slidingly therein.

19. The reaction apparatus according to claim 18, wherein:
the movable hinge shaft is integrally formed with the first end of the lifting member.

20. The reaction apparatus according to claim 5, further comprising:
a movable hinge rotatably combining the lifting member to the lid, the lifting member rotating relative to the lid.

21. The reaction apparatus according to claim 20, wherein the movable hinge

comprises:

a movable hinge accommodating part combined to the lid, having a movable hinge hole, which is provided approximately parallel to the rotation axis of the lid; and

a movable hinge shaft accommodated in the movable hinge hole, rotatably combined with the first end of the lifting member.

22. The reaction apparatus according to claim 2, wherein:

the movable hinge hole is elongated to allow the movable hinge shaft to move slidingly therein.

23. The reaction apparatus according to claim 22, wherein:

the movable hinge shaft is integrally formed with the first end of the lifting member.

24. A lid rotation system for a reaction apparatus, including a main body, and a lid that opens and closes the main body, the lid rotation system comprising:

a hinge bracket connected to the main body;

a main hinge rotatably connected to the hinge bracket;

a main hinge shaft, rotatably connecting the main hinge and the hinge bracket, and about which, the lid rotates;

an auxiliary hinge, rotatably connected to the main hinge, and connected to the lid;

a lifting member, rotatably connected at a first end thereof to the lid, at a point distanced from the main hinge shaft, and rotatably connected to the main body at a second end thereof; and

a driver driving the lifting member to open and close the lid.

25. The lid rotation system according to claim 24, wherein:

the main body comprises a reaction chamber with a sealing member at an opening thereof;

in a first closed position, the lid engages the sealing member, and the sealing member resists the lid; and

in a second closed position, a vacuum is created in the reaction chamber, and the resistance of the sealing member is overcome, creating an airtight seal around the opening of the reaction chamber.

26. The lid rotation system according to claim 25, wherein:
the main hinge and the auxiliary hinge are rotatably connected by an auxiliary hinge shaft, approximately parallel to the main hinge shaft; and
an inclined part is provided on one of the main hinge and the auxiliary hinge, when the lid moves from the first closed position to the second closed position, the auxiliary hinge rotating within a predetermined range about the auxiliary hinge shaft.

27. The lid rotation system according to claim 26, wherein:
when the vacuum in the reaction chamber is released, the resistance of the sealing member moves the lid from the second closed position to the first closed position, and the auxiliary hinge rotates within the predetermined range about the auxiliary hinge shaft.

28. The lid rotation system according to claim 27, wherein:
when the lid is moved from the first closed position to an opened position, the lid and the auxiliary hinge rotate about the main hinge shaft.

29. The lid rotation system according to claim 26, wherein:
the main hinge comprises a first concave part, and a first protrusion having a first auxiliary hinge hole;
the auxiliary hinge comprises a second concave part, and a second protrusion having a second auxiliary hinge hole; and
the auxiliary hinge shaft is a separate from the main hinge and the auxiliary hinge.
wherein the first concave part mates with the second protrusion, the second concave part mates with the first protrusion, and the auxiliary hinge shaft is inserted through the first and second auxiliary hinge holes.

30. The lid rotation system according to claim 26, wherein:
the main hinge comprises a first protrusion and a first concave part; and
the auxiliary hinge comprises a second protrusion and a second concave part,
wherein
the first concave part mates with the second protrusion, and the second concave part mates with the first protrusion,
the auxiliary hinge shaft is integrally formed with, and protrudes from one of the first protrusion and the second protrusion, and

the remaining one of the first protrusion and the second protrusion is provided with an auxiliary hinge hole, in which the auxiliary hinge shaft is inserted.

31. The lid rotation system according to claim 26, wherein:
the main hinge shaft is rotatably connected to the hinge bracket;
the main hinge is provided with a main hinge hole, thorough which the main hinge shaft passes; and
the main hinge is connected to the main hinge shaft.

32. The lid rotation system according to claim 26, wherein:
the main hinge shaft is integrally formed with and protrudes from the hinge bracket;
the main hinge is provided with a main hinge hole, thorough which the main hinge shaft passes; and
the main hinge is rotatably connected to the main hinge shaft.

33. The lid rotation system according to claim 25, wherein the lifting member comprises:
an outer member;
an inner member, movably disposed in the outer member
a movable hinge rotatably connecting a first end of the inner member to the lid;
a combiner rotatably connecting a first end of the outer member to the main body; and
wherein the driver is connected to the outer member, and moves the inner member to open and close the lid.

34. The lid rotation system according to claim 33, wherein the driver comprises:
a driving motor; and
a motion converter, positioned on the outer member, and converting movement of the driving motor into movement of the inner member.

35. The lid rotation system according to claim 34, wherein the motion converter comprises:
a bevel gear train.

36. The lid rotation system according to claim 34, wherein the motion converter

comprises:

a worm gear train.

37. The lid rotation system according to claim 34, wherein the driver further comprises:

at least one location sensor; and

a controller, controlling the driving motor using information regarding a position of the inner member received from the at least one location sensor.

38. The lid rotation system according to claim 33, wherein the movable hinge comprises:

a movable hinge accommodating part with a movable hinge hole therein; and

a movable hinge shaft, inserted into the movable hinge hole, and connected to the first end of the inner member,

wherein the movable hinge hole is approximately parallel to the main hinge shaft.

39. The lid rotation system according to claim 38, wherein:
the movable hinge shaft and the inner member are integrally formed.

40. The lid rotation system according to claim 38, wherein:
the movable hinge hole is elongated, the movable hinge shaft being movable within the movable hinge hole.

41. The lid rotation system according to claim 40, wherein:
the movable hinge is located at a first end position of the movable hinge hole when the lid is completely open, and when the lid is in the second closed position;
the movable hinge is located at a second end position of the movable hinge hole when the lid is closing; and
the movable hinge is located at an intermediate position of the movable hinge hole when the lid is in the first closed position.

42. The lid rotation system according to claim 24, wherein the reaction apparatus further comprises:

an additional lifting member provided on a side of the main body opposite the lifting

member.

43. A reaction apparatus, comprising:

a main body with a reaction chamber, and a sealing member disposed at an opening of the reaction chamber;

a lid, rotationally opening and closing the reaction chamber;

a lid rotation system that positions the lid approximately parallel to the sealing member, to ease creation of a vacuum in the reaction chamber; and

a driver, driving the lid rotation system to automatically open and close the lid, and maintain closure of the lid during creation of a vacuum in the reaction chamber.